

WHAT IS CLAIMED IS:

1. A packet switch, comprising:
 - a plurality of input side transfer units from which
5 packets are entered;
 - a plurality of output side transfer units from which
packets are outputted;
 - a switching unit through which each packet entered
from each input side transfer unit is switched to a desired
10 output side transfer unit;
 - a congestion status monitoring unit configured to
monitor a congestion status of each transfer target within
the packet switch;
 - a priority level attaching unit configured to attach a
15 priority level to each packet, according to the congestion
status of a transfer target of each packet monitored by the
congestion status monitoring unit; and
 - a packet selection unit configured to select one
packet that is to be transferred at a higher priority among
20 colliding packets when a packet collision occurs within the
switching unit, according to the priority level attached to
each colliding packet.
2. The packet switch of claim 1, wherein the priority
25 level attaching unit attaches a lower priority level to a
packet for which a congestion level of a transfer target is
higher.
3. The packet switch of claim 1, wherein the priority
30 level attaching unit is provided inside each input side
transfer unit.
4. The packet switch of claim 1, wherein the priority
level attaching unit sets a temporarily high priority level
35 to one or a plurality of packets that are to be transferred

to one transfer target initially when the congestion status of said one transfer target that is referred in order to attach the priority level to each packet is unknown or invalid.

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5. The packet switch of claim 1, wherein the the priority level attaching unit sets the priority level to be attached to each packet by referring to a congestion level table that stores a congestion level set to each prescribed
10 transfer target according to the congestion status monitored by the congestion status monitoring unit, the congestion level table being provided for each one or a plurality of the input side transfer units.

15 6. The packet switch of claim 1, wherein the congestion status monitoring unit is provided inside each output side transfer unit.

7. The packet switch of claim 6, wherein the congestion
20 status monitoring unit monitors the congestion status of each prescribed transfer target for a corresponding output side transfer unit, each class of the corresponding output side transfer unit, each port of the corresponding output side transfer unit, each classes of each port of the
25 corresponding output side transfer unit, or each flow of each class of each port of the corresponding output side transfer unit.

8. The packet switch of claim 1, wherein the congestion
30 status monitoring unit notifies a monitored congestion status such that the monitored congestion status is reflected into the priority level attached by the priority level attaching unit.

35 9. The packet switch of claim 8, wherein the priority

level attaching unit is provided inside each input side transfer unit, and the congestion status monitoring unit notifies a prescribed information regarding the monitored congestion status to one input side transfer unit that has
5 transmitted one packet, at a timing of arrival of said one packet to the output side transfer unit.

10. The packet switch of claim 1, further comprising:
a scheduling unit provided for each input side
10 transfer unit and configured to control an order of transfers of a plurality of packets that are waiting for transfers to the switching unit at each input side transfer unit, such that those packets destined to non-congested transfer targets are transferred to the switching unit at
15 higher priority by accounting for the congestion status of a transfer target of each packet.

11. The packet switch of claim 1, wherein a packet with the priority level attached thereto is transferred from a
20 input side transfer unit via the switching unit to a output side transfer unit, the switching unit transfers one colliding packet selected from colliding packets by accounting for the priority level attached to each colliding packet, to the output side transfer unit when a
25 packet collision occurs inside the switching unit while discarding other colliding packets inside the switching unit,

the input side transfer unit re-transmits each discarded packet when a packet discarding due to the packet
30 collision is detected, and

the priority level attaching unit is provided at the input side transfer unit and sets the priority level to be attached to each re-transmission packet higher than the priority level originally attached to a corresponding
35 discarded packet.

12. The packet switch of claim 1, wherein a packet with the priority level attached thereto is transferred from a input side transfer unit via the switching unit to an
5 output side transfer unit, the switching unit transfers one colliding packet selected from colliding packets by accounting for the priority level attached to each colliding packet, at higher priority to the output side transfer unit when a packet collision occurs inside the
10 switching unit,

the priority level attaching unit is provided at the input side transfer unit, and

when a plurality of packets subdividing one data are to be transferred from the input side transfer unit, the
15 priority level attaching unit sets the priority level of one packet corresponding to a top portion of said one data lower than the priority level of other packets corresponding to subsequent portions of said one data.

20 13. The packet switch of claim 12, wherein the priority level attaching unit sets the priority level of said one packet than the priority level of the other packets by setting the priority level of the other packets higher than the priority level attached to packets that do not belong
25 to said plurality of packets subdividing one data.

14. The packet switch of claim 1, wherein each input side transfer unit transfers a packet along with the congestion status inside the input side transfer unit at a time of
30 transferring the packet via the switching unit to an output side transfer unit, and

the output side transfer unit obtains a comprehensive congestion status using the congestion status inside the input side transfer unit that is notified along with the
35 packet and the congestion status inside the output side

transfer unit, and carries out a congestion control using the comprehensive congestion status in order to control an amount or a rate of packet flows flowing through a network in which the packet switch is provided.

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15. A packet switch, comprising:

a plurality of input side transfer units from which packets are entered;

10 a plurality of output side transfer units from which packets are outputted;

a switching unit through which each packet entered from each input side transfer unit is switched to a desired output side transfer unit, the switching unit having a configuration in which no packet collision occurs;

15 a congestion status monitoring unit configured to monitor a congestion status of each prescribed transfer target; and

20 a connection pattern calculation engine configured to attach a priority level to each packet, according to the congestion status of a transfer target of each packet monitored by the congestion status monitoring unit, carry out a simulation in which each packet is assumed to be transferred through a virtual switching network having a topology in which a packet collision may occur and a packet
25 to be transferred at higher priority among colliding packets is selected according to the priority level attached to each colliding packet when the packet collision occurs in the virtual switching network, and determine a connection pattern of the switching unit such that a result
30 of switching packets at the switching unit coincides with a result of transferring packets from the input side transfer units to the output side transfer units according to the simulation.

35 16. The packet switch of claim 15, wherein the switching

unit is formed by a cross-bar switch, and the virtual switching network is a switching network formed by switching elements.

- 5 17. A packet switching method of a packet switch in which a packet is transferred from an input side transfer unit via a switching unit to a desired output side transfer unit, the method comprising:

transferring the packet by attaching a priority level
10 according to a congestion status of a transfer target of the packet, from the input side transfer unit to the switching unit;

switching the packet transferred from the input side transfer unit according to the transfer target of the
15 packet at the switching unit, and transferring one colliding packet selected from colliding packets by accounting for the priority level attached to each colliding packet, at higher priority to the output side transfer unit when a packet collision occurs within the
20 switching unit; and

notifying information indicating a monitoring result of the congestion status for a prescribed unit of monitoring, from the output side transfer unit to which the packet has reached, to the input side transfer unit which
25 transmitted the packet.

18. A computer usable medium having computer readable program codes embodied therein for causing one or a plurality of computers to function as a packet switch in
30 which a packet is transferred from an input side transfer unit via a switching unit to a desired output side transfer unit, the switching unit having a function of selecting one packet that is to be transferred at a higher priority among colliding packets when a packet collision occurs within the
35 switching unit, according to a priority level attached to

each colliding packet, the computer readable program codes include:

a first computer readable program code for causing said one or a plurality of computers to monitor a
5 congestion status of each transfer target within the packet switch; and

a second computer readable program code for causing said one or a plurality of computers to attach the priority level to each packet, according to the congestion status of
10 a transfer target of each packet monitored by the first computer readable program code.

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